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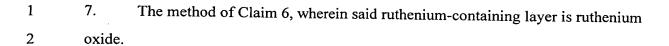
U.S. Express Mail No.: ET163857251US

CLAIMS

We claim:

A method of preheating a substrate which includes a metal-containing layer to a temperature of at least 150 °C, wherein said method comprises exposing said substrate to a preheating plasma which is sufficiently reactive with said metal-containing layer that a deposit or residue formed during preheating which includes metal from said metal-containing layer is more easily etched than said metal-containing layer during a subsequent plasma atching of said metal-containing layer, wherein said metal is selected from the group consisting of platinum, iridium, ruthenium, and combinations thereof..

- 2. The method of Claim 1, wherein said metal-containing layer is a platinum-containing layer and a first source gas used to produce said preheating plasma includes nitrogen.
- 1 3. The method of Claim 2, wherein said platinum-containing layer is platinum.
- 1 4. The method of Claim 2 or Claim 3, wherein said first source gas is at least 50 % by volume nitrogen.
- 5. The method of Claim 4, wherein a second plasma source gas used during subsequent plasma etching of said platinum-containing layer or said platinum layer is at least 15 % by volume nitrogen.
- 1 6. The method of Claim 1, wherein said metal-containing layer is a ruthenium-2 containing layer and a first source gas used to produce said preheating plasma includes a 3 gas selected from the group consisting of nitrogen, oxygen, and combinations thereof.



- 1 8. The method of Claim 6, wherein said ruthenium-containing layer is ruthenium.
- 9. The method of Claim 7 or Claim 8, wherein said first source gas is at least 50 % by volume nitrogen.
- 1 10. The method of Claim 9, wherein said first source gas is nitrogen.
- 1 11. The method of Claim 7 or Claim 8, wherein said first plasma source gas is at least 50 % or more oxygen by volume.
- 1 12. The method of Claim 11, wherein said first plasma source gas is oxygen.
- 1 13. The method of Claim 9, wherein a second plasma source gas used during
 2 subsequent plasma etching of said ruthenium-containing layer is at about 70 % or more
 3 oxygen by volume.
- 1 14. The method of Claim 10, wherein a second plasma source gas used during
- 2 subsequent plasma etching of said ruthenium-containing layer is about 70 % or more
- 3 oxygen by volume.
- 1 15. The method of Claim 11, wherein a second plasma source gas used during
- 2 subsequent plasma etching of said ruthenium-containing layer is at about 70 % or more
- 3 oxygen by volume.
- 1 16. The method of Claim 12, wherein a second plasma source gas used during

- 2 subsequent plasma etching of said ruthenium-containing layer is about 70 % or more
- 3 oxygen by volume.
- 1 17. The method of Claim 1, wherein said metal-containing layer is an iridium-
- 2 containing layer and a first source gas used to produce said preheating plasma includes a
- gas selected from the group consisting of nitrogen, oxygen, and combinations thereof.
- 1 18. The method of Claim 17, wherein said iridium-containing layer is iridium
- 2 oxide.
- 1 19. The method of Claim 17, wherein said iridium-containing layer is iridium.
- 1 20. The method of Claim 18 or Claim 19, wherein said first source gas is at least
- 2 50 % by volume nitrogen.
- 1 21. The method of Claim 20, wherein said first source gas is nitrogen.
- 1 22. The method of Claim 18 or Claim 19, wherein said first plasma source gas is
- 2 about 50 % or more oxygen by volume.
- 1 23. The method of Claim 22, wherein said first plasma source gas is oxygen.
- 1 24. The method of Claim 20, wherein a second plasma source gas used during
- 2 subsequent plasma etching of said iridium-containing layer is at about 70 % or more
- 3 oxygen by volume.
- 1 25. The method of Claim 21, wherein a second plasma source gas used during
- 2 subsequent plasma etching of said iridium-containing layer is at about 70 % or more

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3	oxygen	by	volume.
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1	26.	The method of Claim 22, wherein a second plasma source gas used during
2	subseq	uent plasma etching of said iridium-containing layer is at about 70 % or more
3	oxyger	by volume.

27. The method of Claim 23, wherein a second plasma source gas used during subsequent plasma etching of said iridium-containing layer is at about 70 % or more oxygen by volume.

A method of plasma heating a substrate and etching a platinum-containing layer included in said substrate, said method comprising:

- a) supplying a first nitrogen-comprising plasma source gas to a process chamber containing said substrate;
- b) preheating said substrate to a temperature of at least 150 °C using ion bombardment from a plasma generated from said first nitrogen-comprising plasma source gas;
- c) supplying a second nitrogen-comprising plasma source gas to said process chamber; and
- d) forming a plasma from said second nitrogen-comprising source gas to etch said platinum-containing layer while removing platinum-comprising deposits generated during said preheating of said substrate.
- 1 29. The method of Claim 28, wherein said first nitrogen-comprising plasma 2 source gas contains at least 50 % nitrogen by volume.
- 1 30. The method of Claim 29, wherein said first nitrogen-comprising plasma 2 source gas is nitrogen.

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1	31.	The method of Claim 28 or Claim 29, wherein said second nitrogen-
2	comprisir	ng plasma source gas contains about 15 % or more nitrogen by volume

1 The method of Claim 31, wherein said second nitrogen-comprising plasma 32. also includes at least one inert, non-reactive gas selected from the group consisting of 2 3 helium, neon, argon, krypton xenon, and combinations thereof..

A method of plasma heating a substrate and etching a ruthenium-containing layer included in said substrate, said method comprising:

- supplying a first plasma source gas comprising a gas selected from the a) group consisting of nitrogen, oxygen, or combinations thereof into a process chamber containing said substrate;.
- preheating said substrate to a temperature of at least 150 °C using ion b) bombardment from a plasma generated from said first plasma source gas;
- c) supplying a second plasma source gas comprising oxygen to said process chamber; and
- forming a plasma from said second source gas to etch said rutheniumd) containing layer while removing ruthenium-comprising deposits generated during said preheating of said substrate.
- 1 The method of Claim 33, wherein said ruthenium-containing layer is 34. 2 ruthenium oxide.
- 1 35. The method of Claim 33, wherein said ruthenium-containing layer is 2 ruthenium.
- The method of Claim 34 or Claim 35, wherein said first source gas is at least 1 36.

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- 2 50 % by volume nitrogen.
- 1 37. The method of Claim 36, wherein said first source gas is nitrogen.
- 1 38. The method of Claim 34 or Claim 35, wherein said first source gas is about 50 % or more oxygen by volume.
- 1 39. The method of Claim 38, wherein said first plasma source gas is oxygen.
- 1 40. The method of Claim 36, wherein said second plasma source gas used during subsequent plasma etching of said ruthenium-containing layer is at about 70 % by volume or more oxygen.
 - 41. The method of Claim 37, wherein said second plasma source gas used during subsequent plasma etching of said ruthenium-containing layer is about 70 % by volume or more oxygen.
 - 42. The method of Claim 38, wherein said second plasma source gas used during subsequent plasma etching of said ruthenium-containing layer is at about 70 % by volume or more oxygen.
- 1 43. The method of Claim 39 wherein said second plasma source gas used during 2 subsequent plasma etching of said ruthenium-containing layer is about 70 % by volume 3 or more oxygen.
 - 44. A method of plasma heating a substrate and etching an iridium-containing layer included in said substrate, said method comprising:
 - a) supplying a first plasma source gas comprising a gas selected from the

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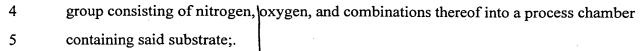
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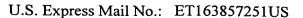
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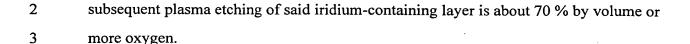
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- b) preheating said substrate to a temperature of at least 150 °C using ion bombardment from a plasma generated from said first plasma source gas;
 - c) supplying a second plasma source gas to said process chamber; and
- d) forming a plasma from said second source gas to etch said iridium-containing layer while removing iridium-comprising deposits generated during said preheating of said substrate..
- 1 45. The method of Claim 44, wherein said second source gas includes oxygen.
 - 46. The method of Claim 44 or Claim 45, wherein said iridium-containing layer is iridium oxide.
 - 47. The method of Claim 44 or Claim 45, wherein said iridium-containing layer is iridium.
- 1 48. The method of Claim 44, wherein said first source gas is at least 50 % by volume nitrogen.
- 1 49. The method of Claim 44, wherein said first source gas is about 50 % or more oxygen by volume.
- The method of Claim 45, wherein said second plasma source gas used during subsequent plasma etching of said iridium-containing layer is at about 70 % by volume or more oxygen.
- 1 51. The method of Claim 46, wherein said second plasma source gas used during

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- 1 52. The method of Claim 47, wherein said second plasma source gas used during 2 subsequent plasma etching of said iridium-containing layer is at about 70 % by volume 3 or more oxygen.
- 1 53. The method of Claim 48, wherein said second plasma source gas used during subsequent plasma etching of said iridium-containing layer is at about 70 % by volume 2 3 or more oxygen.
- 54. The method of Claim 49, wherein said second plasma source gas used during 2 subsequent plasma etching of said iridium-containing layer is at about 70 % by volume 3 or more oxygen.
- 55. The method of Claim 50, wherein said second plasma source gas includes an inert, 1 2 non-reactive gas selected from the group consisting of helium, neon, argon.
- 1 56. The method of Claim 51, wherein said second plasma source gas includes an inert, 2 non-reactive gas selected from the group consisting of helium, neon, argon.
- 1 57. The method of Claim 52, wherein said second plasma source gas includes an inert, 2 non-reactive gas selected from the group consisting of helium, neon, argon.